

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

2

another end of said copper fuse section being connected to said second wiring line; and
an opening formed in said third and second film sections of said dielectric film and between said first and second wiring lines, wherein said opening provides access to said laser beam to oxidize said copper fuse section in said oxidizing environment.

REMARKS

Applicant respectfully submits that entry of this §1.116 Amendment is proper, since the Amendment only corrects a typographical error. Such an amendment does not raise a new issue requiring a further search and/or consideration by the Examiner. As such, entry of this Amendment is believed proper and is earnestly solicited.

Claims 1-16 are pending in this application. Claims 8-14 are withdrawn from present consideration. By this Amendment, claim 1 is amended to correct a typographical error. No new matter is added to claim 1. Reconsideration in view of the foregoing amendment and the following remarks is respectfully solicited.

Attached hereto is a marked-up version of the change made to the claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Claims 1-6 stand rejected under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,111,301 to Stamper. Claims 7 and 15 stand rejected under 35 U.S.C. §103(a) as unpatentable over Stamper and further in view of U.S. Patent No. 6,162,686 to Huang et al. (hereinafter, Huang). Claim 16 stands rejected under 35 U.S.C. §103(a) as unpatentable over Stamper and Huang and further in view of U.S. Patent No. 6,100,118 to Shih et al. (hereinafter, Shih).

These rejections are respectfully traversed in view of the following discussion.

II. THE RELATED ART REFERENCES

A. The Stamper Reference

Stamper discloses *inter alia* a fusible link 12, located on the right-side of the structure depicted in Fig. 4, which is a combination of 3, that is, a copper diffusion barrier, and 6, that is, a metal, presumably copper (col.3, lines 15 and 14). The fusible link 12 is formed above a

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

3

low resistivity metal 9, an unidentified layer that encompasses the low resistivity metal 9 on three sides, and a film 8 of an intermetal dielectric such as silicon dioxide (Fig. 4 and col. 2, lines 60 and 61).

Claim 1 recites at least the features of "a dielectric film including a first film section formed on a substrate ... said copper fuse section formed on said first film section of said dielectric film, an end of said copper fuse section being connected to said first wiring line and another end of said copper fuse section being connected to said second wiring line."

Applicant respectfully submits that the Office Action mischaracterizes Stamper when it states "Stamper discloses in figure 4 and column 3, lines 7-20 a dielectric film (8), including a first film section (bottom 8), a second film section (bottom half of the middle 8 and the left and right 8's) formed on the first film section, and a third film section (top half of the middle 8) formed over the second film section. Nowhere does Stamper disclose, teach or suggest that the middle 8 film section of Fig. 4 comprises a top and bottom half. Fig. 4 of Stamper clearly illustrates the middle 8 film section as an integral whole.

In fact, Stamper discloses that the corrosion resistant layer 3 of Fig. 1, which includes a via like Fig. 4, is deposited using a conformal method, such that, that the corrosion resistant material completely fills the bottom of the via or trench and that the conformal coating fills the corners between metal layers 2 and 6 to prevent forming a continuous path for corrosion (col. 2, lines 48-56). If a second film section was formed that included the bottom half of the middle 8 of Stamper, the conformal coating of the corrosion resistant material would cover both the bottom half of the middle 8 and both left and right 8's. The corrosion resistant material covering the upper surfaces of the bottom half of the middle 8 and both left and right 8's would then have to be removed before depositing the SiO₂ of the top half of the middle 8 and again depositing a conformal coating of the barrier resistant material to cover the top half of the middle 8 facing the via. It is far more likely that the conformal coating is deposited once, after the left and right 8's are etched away from an upper surface corresponding to the top of the middle 8 and leaving a central core of SiO₂, corresponding to the hole of the via.

Furthermore, nowhere does Stamper disclose, teach or suggest a formation process that would indicate other than the middle 8 film section as being an integral whole. Therefore, the characterization of the middle 8 film section of Fig. 4 in Stamper comprising a

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

4

top and bottom half appears to result from impermissible hindsight reconstruction by the Examiner.

In addition, the Office Action characterizes the bottom 8 as corresponding to the claimed invention's first film section. However, claim 1 clearly recites "a dielectric film including a first film section formed on a substrate." Nowhere does Stamper disclose, teach or suggest the bottom 8, which allegedly corresponds to the first film section of the claimed invention, as being formed on a substrate. Therefore, Stamper does not disclose, teach or suggest a dielectric film including a first film section formed on a substrate, as recited in claim 1.

Furthermore, the fusible link 12 of Stamper in Fig. 4 overlies only the relatively low resistivity metal 9 and a section of the intermetal dielectric 8. Nowhere does Stamper disclose, teach or suggest that the fusible link 12 of Fig. 4, corresponding to the claimed invention's copper fuse section, is connected at one end to a wiring line and at the other end to another wiring line. Stamper merely discloses that the metal layer 6 of the fusible link 12 is connected at one end to the underlying low resistivity metal 9. Therefore, Stamper does not disclose, teach or suggest "an end of said copper fuse section being connected to said first wiring line and another end of said copper fuse section being connected to said second wiring line" as recited in claim 1.

For at least the reasons outlined above, Applicant respectfully submits that Stamper does not disclose, teach or suggest every feature of claim 1. Accordingly, Stamper fails to anticipate the subject matter of claim 1 and claims 2-6, which depend on claim 1, under 35 U.S.C. §102(e). Withdrawal of the rejection of claims 1-6 under 35 U.S.C. §102(e) as anticipated by Stamper is respectfully solicited.

B. The Huang Reference

Huang discloses *inter alia* a method of fabricating a fuse formed of a plug (col. 4, lines 18 and 19 and Fig. 1) including forming first and second conductive strips 20A, 20B of a first conductive layer 12 over a fuse area 12 (col. 4, lines 41-44), forming a fuse contact plug 26 in a first insulating layer 24 to contact the first and second conductive strips 20A, 20B (col. 4, lines 45-52), forming a first metal ring 34 on the interlevel dielectric (ILD) layer

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

5

surrounding the fuse area 12 (col. 4, lines 54-15), forming a first inter metal dielectric (MMD) layer (second insulating layer) 30 over the contact plug 26 and the first metal ring 34 (col. 4, lines 57-59), and forming a second metal ring 44 on the first plug rings 38A (col. 5, lines 1 and 2 and Fig. 2). Huang also discloses that the first metal layer and all metal layers are preferably composed of an Al-Cu alloy (col. 6, lines 20-22 and Fig. 5).

Huang does cure the deficiencies of Stamper. Applicant respectfully submits that nowhere does Huang disclose, teach or suggest the features of "a dielectric film including a first film section formed on a substrate ... said copper fuse section formed on said first film section of said dielectric film." Fig. 5 of Huang clearly depicts the plug fuse 58B, corresponding to the claimed invention's copper fuse section, is located above the plugs 38B and the second insulating layer 30, corresponding to the claimed invention's second film section, which in turn lies above the first insulating layer 24 that is formed in turn on the substrate 10. Therefore, Huang does not disclose, teach or suggest "said copper fuse section formed on said first film section of said dielectric film," as recited in claim 1.

For at least the reasons outlined above in response to the rejection of claims 1-6 under 35 U.S.C. §102(e) as anticipated by Stamper and the reasons outlined immediately above in regard to Huang, Applicant respectfully submits that Stamper and Huang either individually or in combination fail to disclose, teach or suggest every feature of claim 1. Accordingly, Stamper and Huang either individually or in combination fail to render obvious the subject matter of claim 1 and claims 7 and 15, which depend from claim 1, under 35 U.S.C. §103(a). Withdrawal of the rejection of claims 7 and 15 under 35 U.S.C. §103(a) over Stamper in view of Huang is respectfully solicited.

C. The Shih Reference

Shih discloses *inter alia* a method of fabricating a metal guard ring, e.g., 139, 149, 159, around a metal fuse 141 and fuse opening 88 (Abstract, lines 1 and 2 and Fig. 1). Shih also discloses a second metal layer 42 (M2) is formed over the first metal plugs 36 and the second insulating layer and a second level metal fuse 41 contacting the second fuse interconnects 38A, 38B, where the second metal layer 42 (M2) (guard ring) surrounds the second level metal fusible link 41 (col 8, lines 39-43 and Fig. 3).

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

6

Shih does not cure the deficiencies of Stamper and Huang. Applicant respectfully submits that nowhere does Shih disclose, teach or suggest the features of "a dielectric film including a first film section formed on a substrate ... said copper fuse section formed on said first film section of said dielectric film." Fig. 3 of Huang clearly depicts the metal fuse 41, corresponding to the claimed invention's copper fuse section, is located above the second level fuse interconnects 38A and the second insulating layer 34, corresponding to the claimed invention's second film section, which in turn lies above the first insulating layer 24 that is formed over the first and second polysilicon lines 22A, 22B and the isolation region 20, which is further in turn formed over the substrate 10. Therefore, Shih does not disclose, teach or suggest "said copper fuse section formed on said first film section of said dielectric film," as recited in claim 1.

For at least the reasons outlined above in response to the rejection of claims 1 and 7 under, respectively, 35 U.S.C. §102(e) as anticipated by Stamper and 35 U.S.C. §103(a) as unpatentable over Stamper in view of Huang, and the reasons outlined immediately above in regard to Shih, Applicant respectfully submits that Stamper, Huang and Shih either individually or in combination fail to disclose, teach or suggest every feature of claim 1. Accordingly, Stamper, Huang and Shih either individually or in combination fail to render obvious the subject matter of claim 1 and claims 7 and 16, which depend from claim 1, under 35 U.S.C. §103(a). Withdrawal of the rejection of claim 16 under 35 U.S.C. §103(a) over Stamper and Huang and further in view of Shih is respectfully solicited.

For the reasons stated above, the claimed invention is fully patentable over the cited references.

III. CONCLUSION

In view of the foregoing, Applicant submits that claims 1-7 and 15-16, all the claims presently being considered in this application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

7

below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

Date: _____

Peter A. Balnave
Reg. No. 46,199

McGinn & Gibb, PLLC
8321 Old Courthouse Rd. Suite 200
Vienna, VA 22182-3817
(703) 761-4100
Customer No. 21254

Serial No. 09/532,892
Docket No. 00USFP465-M.K.

8

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend claim 1 as follows:

1. A semiconductor memory device, including a copper fuse section that is oxidized by a laser beam in an oxidizing environment, comprising:
 - a dielectric film including a first film section formed on a substrate, a second film section formed on said first film section, and a third film section formed over said second film section;
 - a wiring line structure, [includingz] including:
 - a first and a second wiring line, each of said first and second wiring lines formed on said second film section of said dielectric film and extending in an opposite direction, and
 - said copper fuse section formed on said first film section of said dielectric film, an end of said copper fuse section being connected to said first wiring line and another end of said copper fuse section being connected to said second wiring line; and
 - an opening formed in said third and second film sections of said dielectric film and between said first and second wiring lines, wherein said opening provides access to said laser beam to oxidize said copper fuse section in said oxidizing environment.